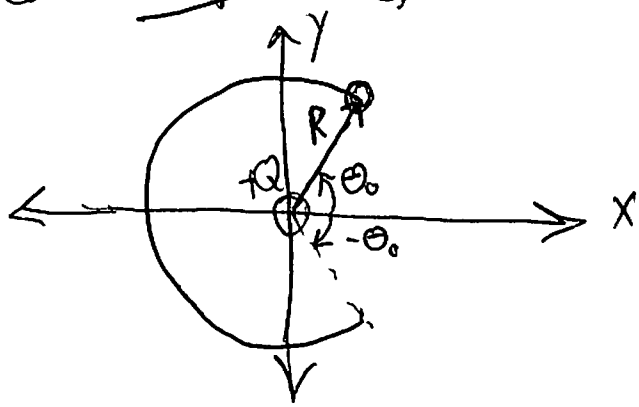
Jan 19th Section Problem Example

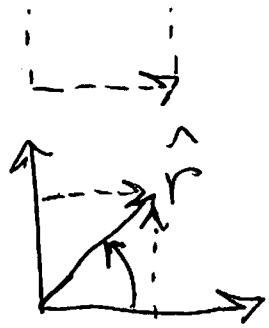
$$\lambda = \frac{\lambda_0}{\cos\theta}$$



~~$L = R(2\pi - 2\theta_0)$~~

$\lambda_0 > 0$

$$\vec{dF} = +\hat{r}\frac{kQ\,dq}{r^2} = +\hat{r}\frac{kQ\,dq}{R^2}$$



$$dq = \lambda\, d\theta R = \frac{\lambda_0}{\cos\theta} d\theta R$$

$$\vec{dF} = +\hat{r}\frac{kQ\,\lambda_0\,d\theta R}{\cos\theta\, R^2}, \quad \hat{r} = -(\cos\theta, \sin\theta)$$

~~$\vec{dF} = -\hat{r}\,k$~~

$$\vec{dF} = -(\cos\theta, \sin\theta)\frac{kQ\lambda_0 d\theta R}{\cos\theta\, R^2}$$

$$F_x = -\frac{kQ\lambda_0}{R^2}\int_{\theta_0}^{2\pi-\theta_0} d\theta = -\frac{kQ\lambda_0}{R}(2\pi - \theta_0 - \theta_0)$$

$$\boxed{F_x = -\frac{1}{4\pi\varepsilon_0}\frac{Q\lambda_0}{R}(2\pi - 2\theta_0)}$$

$$F_y = -\frac{kQ\lambda_0}{R^2}\int_{\theta_0}^{2\pi-\theta_0} d\theta \tan\theta = +\frac{kQ\lambda_0}{R}\ln(\cos\theta)\Big|_{\theta_0}^{2\pi-\theta_0}$$

~~$\log(\cos(2\pi - \theta_0)) - \log$~~ $\ln(\cos(2\pi-\theta_0)) - \ln(\cos(\theta_0))$

$= 0$

$$\boxed{\vec{F} = -\hat{e}_x\frac{1}{4\pi\varepsilon_0}\frac{Q\lambda_0}{R}(2\pi - 2\theta_0)}$$